

# **EPA Superfund Explanation of Significant Differences:**

**DENVER RADIUM SITE  
EPA ID: COD980716955  
OU 02  
DENVER, CO  
09/17/1993**

Text:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION VIII  
999 8th STREET - SUITE 500  
DENVER, COLORADO 80202-2466

Ref: 8HWM-SR

MEMORANDUM

TO: Robert L. Duprey, Director  
Hazardous Waste Management Division

FROM: Dianna Shannon, Chief  
Superfund Remedial Branch

SUBJECT: Explanation of Significant Differences to the ROD for  
Denver Radium Superfund Site, Operable Unit II -  
Du-Wald Steel Corporation

Attached is the final Explanation of Significant Differences (ESD) between the 1987 Record of Decision (ROD) and the remedy which will be implemented at Operable Unit II of the Denver Radium Superfund Site.

The remedy selected in the 1987 ROD for OU II called for the excavation of radium contaminated soils to meet cleanup levels identified in 40 CFR Part 192. Excavated soils were to be shipped to a permanent disposal facility licensed to accept such waste.

It became necessary to modify the selected remedy when elevated concentrations of lead were discovered in soils and debris on the Du-Wald property during the design phase of the radium cleanup. Much of the lead contamination was present in soils that contained radium-226 in excess of the cleanup levels identified in the ROD (commingled contamination). EPA modified the selected remedy because commingled contamination could not be placed in the permanent disposal facility without first being treated to reduce the mobility of the lead component. In addition, this ESD describes how the remedy was modified to address the discovery of much larger volumes of contamination than were anticipated at the time of the ROD, why temporary storage was not utilized, and how radiologic contamination was left underneath structures and around public utilities on the Du-Wald property.

The State of Colorado supports implementation of the remedy as proposed in this ESD. In addition, EPA Headquarters has reviewed this ESD and has provided written concurrence to the Region (attached). I recommend approval of the changes to the remedy proposed in this ESD.

Attachments

EXPLANATION OF SIGNIFICANT DIFFERENCES  
RECORD OF DECISION (ROD) - OPERABLE UNIT II  
DENVER RADIUM SUPERFUND SITE

DECLARATION

Considering the new information that has been developed and the change that have been made to the selected remedy chosen in the September 29, 1987 ROD, EPA has determined that the remedy remains protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to this remedial action, except those for which a waiver is invoked, and is cost-effective. In addition, the revised remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this Site.

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Robert L. Duprey Director  
Hazardous Waste Management Division

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Date

EXPLANATION OF SIGNIFICANT DIFFERENCES  
FOR  
SEPTEMBER 29, 1987 RECORD OF DECISION  
DENVER RADIUM SITE  
OPERABLE UNIT II

INTRODUCTION

This document explains the significant difference between the remedy chosen in the Record of Decision (ROD) signed by the U.S. Environmental Protection Agency (EPA) on September 29, 1987, and the remedy implemented at Operable Unit II (OU II) of the Denver Radium Superfund Site located at 11th Avenue and Umatilla Street, Denver, Colorado. Specifically, this Explanation of Significant Differences (ESD) focuses on contamination that is present on the Du-Wald Steel Corporation (Du-Wald) property located at 1100 Umatilla Street. EPA is the lead agency for the site and the Colorado Department of Health is the support agency.

Under Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or Superfund), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and Section 300.435(c)(2)(i) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), EPA is required to publish an ESD when the remedy implemented differs significantly from that described in the ROD.

The remedy selected in the 1987 ROD for OU II called for the excavation of radium contaminated soil to meet cleanup levels identified in 40 CFR Part 192. Excavated soils were to be shipped to a permanent disposal facility licensed to accept such waste.

It became necessary to modify the selected remedy when elevated concentrations of lead were discovered in soils and debris on the Du-Wald property during the design phase of the radium cleanup. Much of the lead contamination was present in soils that contained radium-226 in excess of the cleanup levels identified in the ROD (commingled contamination). The remainder of the lead contamination present in soils was free of radiologic contamination. More commingled contamination was discovered during the excavation of radium-only contaminated soils in the southern portion of the Du-Wald property. EPA modified the selected remedy because commingled contamination could not be placed in the permanent disposal facility without first being treated to reduce the mobility of the lead component. In addition, this ESD describes how the remedy was modified to address the discovery of much larger volumes of contamination than were anticipated at the time of the ROD, why temporary storage was not utilized, and how radiologic contamination was left underneath structures and around public utilities on the Du-Wald property.

SUMMARY OF SITE HISTORY

The Denver Radium Superfund Site is comprised of 45 properties scattered along the South Platte River Valley that were contaminated as a result of a radium processing industry that flourished in Denver during the period from 1915 to 1927. Production of refined radium produced large quantities of radioactive waste materials. Generally, these materials were discarded or left on-site when the processing facilities were closed. The Du-Wald property is a 10.5 acre site that is included within OU II. Radium contamination on the Du-Wald

property is the result of processing activities conducted by the Schlesinger Radium Company and the Radium Company of Colorado between 1914 and 1923.

The City of Denver owned the site from 1938 to 1948 and operated a municipal landfill on the southern portion of what is now the Du-Wald property. In addition to household waste, large quantities of broken battery casings were placed in the landfill. Residual lead from the casings mixed with radium contaminated soils to create approximately 400 tons of commingled contamination. In the late 1950s and early 1960s, an operation to reclaim lead from batteries was conducted in the northeast quadrant of the site (the area surrounding the East Storage Building). This operation resulted in commingled contamination as well as lead-only contaminated soils.

In 1979, EPA discovered the presence of the long-forgotten radium processing sites. The Denver Radium Site was placed on the Interim Priorities List in October 1981 and on the National Priorities List in September 1983. EPA released a Remedial Investigation for OU II in April of 1986 and a Draft Feasibility Study in August of 1987. No Final Feasibility Study was released. Additional characterization of the radiologic contamination was conducted during the design of the remedy, and is documented in Supplemental Data Release for Operable Unit II by UNC Geotech (December 1988). The discovery of non-radiologic contamination (primarily lead) on the Du-Wald property prompted more data gathering which is presented in "Radiologic and Selected Metals Assessment of the Du-Wald Steel Corporation Property, OU-2" (UNC Geotech, December 1990).

The Du-Wald Steel property is located on the corner of 11th Avenue and Umatilla Street and covers 10.5 acres. The property is used as a commercial facility that buys and sells scrap metal. Scrap metal is stacked in piles as high as 40 feet over much of the property. A portion of the property is covered with reinforced concrete. The topography is fairly level with a slight westerly slope. Two major water conduits, Denver Water Department Conduit 12 and Conduit 18, run east-west across the center of the Du-Wald Steel property. Both of the conduits are approximately five feet deep and carry treated water for commercial and residential use. There is another water-supply conduit running north-south on the eastern boundary of the property. There are six permanent structures on the Du-Wald Steel property. These include four buildings, an aluminum scrap smelter complex, and one permanent scrap metal crane and shredder complex. There is approximately 0.3 mile of railroad track on the property. The number of full-time employees on the premises varies between 35 and 40.

#### SUMMARY OF CONTAMINATION PROBLEMS

Lead, radium and radium's associated decay products are the primary contaminants of concern at the Du-Wald property.

#### Radium and its Associated Decay Products

The Remedial Investigation for the Denver Radium Site estimated that 15,400 cubic yards (23,100 tons) of radium contaminated soils and debris were present on the OU II properties. Additional characterization data gathered after the signing of the ROD resulted in the estimate being revised upward to 80,000 tons.

The radiologic contamination at the Denver Radium Site poses a health hazard by way of three routes of exposure: 1) inhalation of radon gas and its decay products; 2) direct exposure to gamma radiation from the decay of radium and its progeny; and 3) ingestion or inhalation of radium contaminated material. In general, the greater the exposure rate and the longer the exposure to radiation, the greater the associated health hazard. Of these three exposure routes, the most significant risk is that posed by radon gas accumulating in buildings on site. Elevated concentrations of radon decay products were detected in the Du-Wald Steel office building during the Remedial Investigation in 1985. The observed concentration levels of 0.03 Working Levels in the office building exceeded the EPA standard of 0.02 Working Levels. However, emergency response actions were not taken because the patterns of occupancy in the building reduced the likelihood of significant exposure (i.e. the building was not occupied on a continuous basis). It was thought that removal of radium contamination adjacent to the office building would reduce the radon levels inside the office space. Radon testing completed in 1992 after the removal of radium contaminated soils occurred indicated that the EPA standard was still exceeded inside the office building. Thus, a radon mitigation system is being installed to reduce radon concentrations to acceptable levels within the office building. The other buildings on the site have very limited potential for radon accumulation because they are primarily shops and warehouses where the rate of exchange between inside and outside air is high.

Ground water in the shallow alluvial aquifer on the site contains elevated concentrations of uranium, gross alpha and gross beta. The ground water is flowing off the Du-Wald property in a west-northwest direction towards the South Platte River. There is no existing use of the ground water on or downgradient from the site, and it is expected that the water quality will improve drastically due to the removal of the radium contaminated soils on the Du-Wald property.

#### Lead

Elevated concentrations of lead in soil were present in two areas of the Du-Wald property: the area surrounding the East Storage building where the battery cracking operation was conducted; and an area southwest of the shredder complex that was the site of a municipal landfill. Seventy one (71) soil samples were collected from thirty-six (36) bore holes in the area surrounding the East Storage building. Out of the 71 samples, 31 had total concentrations greater than 1,000 ppm. The highest lead concentration was 36,600 ppm.

The UNC Geotech report (December 1990) estimated the volume of lead-only contaminated soil (lead greater than 1,000 mg/kg) around the East Storage building to be 531 cubic yards. In addition, the total volume of soil with commingled contamination (lead and radium) in the area was estimated at 609 cubic yards.

At the start of remedial action at the Du-Wald property, it was thought that lead contamination at the site was limited to the area surrounding the East Storage building. However, 2800 tons of commingled contamination were encountered during the excavation of radium contaminated soils in the southern portion of the property. The lead component of this commingled waste is apparently associated with broken battery casings that were disposed of in a municipal landfill on the property. Toxicity

Characteristic Leaching Procedure (TCLP) results from composite samples collected in this area were as high as 100,000 mg/kg.

Ground water samples from monitoring wells located on the perimeter of the Du-Wald property were negative for lead. Therefore, the primary routes of exposure for lead on the property are inhalation of lead-contaminated dusts and incidental ingestion of lead contaminated dusts and soils.

#### SUMMARY OF THE SELECTED REMEDY IN THE 1987 RECORD OF DECISION

The selected remedy in the September 29, 1987 ROD entailed:

1. Excavating radium contaminated soil from open areas and from under the buildings;
2. Placing the excavated material into a temporary land storage facility to be constructed on the OU II properties;
3. Maintaining the concrete cap that already covers a portion of the contaminated material on the Du-Wald property; and
4. Removing the estimated 15,400 cubic yards of radiologically contaminated material from on-site temporary storage and shipping to a permanent disposal facility when such a facility became available.

Place for temporary on-site storage were abandoned when a permanent disposal facility was licensed to accept radium waste in 1988.

#### DESCRIPTION OF THE SIGNIFICANT DIFFERENCES AND THE BASIS FOR THOSE DIFFERENCES

The significant differences from the 1987 ROD are: (1) a greater volume of radium contaminated soil was excavated and removed, (2) relatively small amounts of radium contamination were left on the Du-Wald property, (3) there was no temporary on-site storage, and (4) soils containing commingled radium and lead were solidified in a cement matrix prior to being shipped to the permanent off-site disposal facility.

Difference 1. Further assessment (UNC Geotech, December 1988 and September 1990) showed the volume of radium-only contaminated soil to be almost four times greater (60,000 yd<sup>3</sup>) than the amount given in the original ROD (15,400 yd<sup>3</sup>).

Difference 2. Radium contaminated soil was left in place in the following locations: a) under structures on the Du-Wald property, b) near the underground power line, c) within a four foot buffer zone around water-and sewer lines, d) below the ground water level, and e) on the Burlington Northern Railroad (BNRR) right-of-way. The reasons that radiologic contamination was not excavated from these locations are summarized below.

- a) Contaminated soil was not excavated from under the Office/Warehouse Complex, East Storage building, Southeast Warehouse Complex, or beneath a one to one slope away from the foundations of these buildings. Contamination under a truck scale adjacent to the Office/Warehouse Complex was left in place because it was located within the one to one slope away from the office. Excavation of this material

would have required demolishing and replacing the buildings. EPA determined that such demolition was not necessary for the remedy to be protective and to meet the interior cleanup standards set forth in 40 CFR Section 192.12(b). That section states that in any occupied or habitable building:

- 1) The objective of remedial action shall be, and reasonable effort shall be made to achieve, annual radon decay product concentration not to exceed 0.02 WL. In any case, the radon decay product concentration shall not exceed 0.03 WL, and
- 2) The level of gamma radiation shall not exceed the background level by more than 20 microroentgens per hour.

Radon levels and gamma radiation were measured during the remedial investigation. In the Du-Wald office, the radon decay product concentration was measured at 0.03 WL. Gamma radiation did not exceed the background level by more than 20 microroentgens per hour. EPA believed the radon decay product concentration would decrease as a result of the removal of radium contaminated soils that were located immediately adjacent to the office. However, when EPA performed radon monitoring after completion of remedial action, results from this testing indicated that the standards set forth in 40 CFR Section 192.12(b) were being exceeded. Therefore, a radon mitigation system is being installed in the office building.

- b) Ninety-four tons of radium contamination were left in place adjacent to a power line that feeds the shredder complex. The line could not be turned off without forcing the scrap metal operation to shut down, and it was considered too dangerous, from a worker safety perspective, to excavate material adjacent to a "live" power line. The cost of rerouting the power line was excessive. It was decided that removal of this radium contaminated soil would not result in substantially greater protection of public health or the environment.
- c) The major water lines and sewer line that cross the Du-Wald property service large populations in downtown Denver and the Washington Park area. The Denver Water Department and Denver Department of Public Works informed EPA that these lines were very old and any earthwork conducted near these lines could cause them to break. Therefore, the decision was made to leave contaminated material within a four-foot buffer zone around these utilities.
- d) The 1990 UNC Geotech assessment showed that radiological contamination exists below the ground water table. EPA decided not to excavate this radium contamination since the primary health risk posed by radium contamination is from the accumulation of radon gas in overlying structures and radon gas in ground water will tend to stay in solution and not migrate upward to the surface.
- e) Small amounts of surface radiologic contamination were left in place on the BNRR right-of-way that lies immediately east of the Du-Wald property. The decision to leave this contamination was made because the large volume of train traffic on this main line severely restricted access for performing cleanup work. It is highly unlikely that buildings will ever be erected on the right-of-way or that



individuals will spend significant amounts of time near the contaminated area. Therefore, the removal of contamination from the right-of-way would not have resulted in the remedy being significantly more protective.

40 CFR Part 192 provides that under certain circumstances the agency performing the cleanup may choose a remedial action that does not achieve complete removal of radium contamination to the levels described in 40 CFR Section 192.12(a). Under 40 CFR Section 192.21(c), "supplemental standards" can be applied when:

"The estimated cost of remedial action to satisfy 40 CFR Section 192.12(a) at a ... site... is unreasonably high relative to the long-term benefits, and the residual radioactive materials do not pose a clear present or future hazard. The likelihood that buildings will be erected or that people will spend long periods of time at such a vicinity site should be considered in evaluating this hazard. Remedial action will generally not be necessary where residual radioactive materials have been placed semi-permanently in a location where site-specific factors limit their hazard and from which they are costly or difficult to remove, or where only minor quantities of residual radioactive materials are involved. Examples are residual radioactive materials under hard surface public roach and sidewalks, around public sewer lines, or in fence post foundations.

The residual radioactive material that was left in place at the Du-Wald property meets the criteria for the application of supplemental standards. A preliminary endangerment assessment prepared by EPA for the Du-Wald property in September of 1992 determined that leaving contaminated material in the aforementioned places would not pose a significant hazard to human health or the environment. Detailed maps showing the location and estimated volume of the radium contamination that remains on the Du-Wald site will be prepared and distributed to interested parties so that any agencies or individuals who conduct maintenance or excavation activities on the property will be aware of the presence of radiologically contaminated materials. Institutional controls will be placed on this property to assure that interested parties are aware of the presence of radiological contamination on the Du-Wald site. Institutional controls may include deed restrictions and special zoning.

Difference 3. Onsite temporary storage of excavated contaminated material was not required since a permanent offsite disposal facility became available before excavation began. The material was shipped by rail to the Envirocare of Utah, Inc. disposal facility in Tooele County, Utah.

Difference 4. Much of the commingled radium/lead contaminated soil discovered on the Du-Wald property was RCRA characteristic waste, as defined by the toxicity characteristic leaching procedure (TCLP). EPA land disposal restrictions prohibit the placement of such waste in a land disposal unit unless the waste is treated to remove the characteristic that makes it a RCRA waste. Therefore, EPA assembled a treatment plant on the Du-Wald property and solidified approximately 2,800 tons of commingled contamination in a cement matrix. Once solidified, the contaminated soil, which no longer exhibited the RCRA characteristic, was shipped to the Envirocare facility.

## Summary of Significant Differences

### Original Remedy

### Modified Remedy

- |   |  |
|---|--|
| 1. Excavation of 15,400 yd <sup>3</sup> of radium contaminated soils  | 1. Over 60,000 yd <sup>3</sup> of radium contaminated soils excavated  |
| 2. Excavation of all radiologically contaminated soil   | 2. No excavation of radiologically contaminated soils <ul style="list-style-type: none"><li>- under buildings</li><li>- under shredder's feeder</li><li>- near utility lines</li><li>- below ground water</li><li>- on railroad right-of way</li></ul> |
| 3. Temporary on-site storage of contaminated material and removal to permanent disposal facility when one becomes available | 3. No temporary storage prior to removal to permanent disposal facility  |
| 4. Soils containing commingled contaminants not addressed   | 4. Solidification of soils containing commingled contaminants prior to removal to permanent disposal facility  |

### SUPPORT AGENCY COMMENTS

The State of Colorado concurs with the implementation of the revised remedy presented in this ESD.

### STATUTORY DETERMINATIONS

Considering the new information that has been developed and the changes that have been made to the selected remedy, EPA and the Colorado Department of Health believe that the remedy remains protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to this remedial action, preference for treatment was given, and is cost-effective. In addition, the revised remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site.

### PUBLIC PARTICIPATION

This ESD will become part of the Administrative Record File pursuant to Section 300.825(a)(2) of the NCP. The Administrative Record File is available for public review at the following location:

EPA Superfund Records Center  
999 18th Street, Suite 500  
Denver, CO 80202  
(303) 293-1807  
Hours: M-F 8:00 AM - 4:30 PM